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TCS-12267-65
25 August 1965
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MEMORANDUM FOR: Chief, Forces Division, ORR

25X1A ATTENTION [redacted]

THROUGH : Chief, Requirements Branch
Reconnaissance Group, CGS

SUBJECT : Electric Power at AMM & Space Installations, USSR

REFERENCE : CIA Requirement C-RR5-82,249
(NPIC Project 11125-5)

The enclosed material is a pre-release of the preliminary photo interpretation analysis of the above mentioned subject. A complete report is presently being prepared and will be forwarded when complete. Minor changes in text may occur between the time of the pre-release and the published report.

25X1A

[redacted]
Assistant for Photographic Analysis, NPIC

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15 pages of text

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INTRODUCTION

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The 17 sites considered in this report include electronic installations at Sary-Shagan Antimissile Test Center (SSATC) and at operational sites near Leningrad, Moscow, Olenegorsk, and Angarsk (Figure 1). In the preparation of analyses of electric power available at the 17 sites, the best of the KEYHOLE photography from [redacted] period was studied and compared with previous studies, but the latest mission does not necessarily provide the quality requisite for identification of electrical equipment and installations. Only under favorable conditions is it possible to obtain photography that permits identification of the locations and shadow configurations of powerline supports, or the transformers and switching equipment at substations. Optimum conditions are required to permit estimating power available in megavolt-amperes (mva), because such estimates require the ability 25X1D

[redacted]

Determination of powerline kilovoltages is based on a number of factors. Fortunately, USSR high-tension electric power technology is standardized to a large extent, providing data that permit a high degree of reliability in photo interpretation if photographic quality permits identification of enough elements. Evaluations presented in this report are based on one or more of the following criteria:

1. The length of conductor spans, based on distances between powerline supports;
2. Configurations of supports and occasionally mensuration of crossarms (usually observed from shadows);

3. Layouts and arrangements of electrical equipment, with some mensuration, at substations associated with and serving the installations; and
4. Sizes and types of transformers.

LENINGRAD AREA AMM/SAM LAUNCH COMPLEXES

A pattern is evident in the analysis of the electric power facilities and source of supply serving the three AMM/SAM launch complexes in the Leningrad area. Each complex has a secured substation which is the terminus of a 110-kilovolt (kv) powerline tied into the Leningrad power grid of the Soviet Unified Power System, and each substation contains 2 stepdown transformers.

NORTHWEST AMM/SAM LAUNCH COMPLEX

The Leningrad Northwest AMM/SAM Launch Complex is located at 60-27-00N 29-44-10E (Figure ___), 37 nautical miles (nm) northwest of Leningrad. Incoming power is supplied by a 1- or 2-circuit 3-phase 110-kv powerline of the Leningrad power grid, via a small switching and transformer substation southeast of the complex, near SAM Site C33A-2. The substation appears to have equipment installed to handle one in-and-out circuit. Two parallel powerlines of the Leningrad power grid bypass southwest of the complex, and the complex is probably electrically independent of them.

Terminus of the incoming powerline at the complex is a secured transformer substation approximately 190 feet square. It is located 1,800 feet southeast of the barracks area, and southwest of the complex access road near its junction with the highway to Leningrad (Figures ___ and ___). The substation has a small control

building which probably contains some provision for housing low-voltage switching equipment. The substation has 3 probable switching positions and two 3-phase, stepdown transformers, each of which is estimated to have a capacity of 70 or more megavolt-amperes (mva).

05/64 Although in a previous report 1/ a probable powerplant had been identified in the support area, recent better quality photography indicates that the building is probably a steam plant, and no powerplant can be identified.

NORTHEAST AMM/SAM LAUNCH COMPLEX

The Leningrad Northeast AMM/SAM Launch Complex is located at 60-05-20N 30-44-00E, 16 nm northeast of Leningrad (Figure ___). Incoming power is probably supplied by a 110-kv powerline of the Leningrad power grid.

At the complex there is a secured transformer substation, approximately 210 by 140 feet, located 1,200 feet southeast of the support area, at the intersection of the access road and the Leningrad-Rakhya highway (Figures ___ and ___). Within the security fence, there is a small control building that probably contains low-voltage switching equipment. The substation is the terminus of a single-circuit, 3-phase, 110-kv powerline, it possibly has 3 switching positions, and it contains 2, probably 3-phase stepdown transformers. The small scale of available photography precludes an estimate of their capacities.

Although a probable powerplant had been identified in the support area in a previous report, 1/ recent photography indicates that the building is probably a steam plant, and no powerplant can be identified.

SOUTHWEST AMM/SAM LAUNCH COMPLEX

The Leningrad Southwest AMM/SAM Launch Complex is located at 59-43-00N 29-18-30E, 33 nm southwest of Leningrad. Incoming power is supplied by a one-circuit 3-phase 110-kv powerline of the Leningrad power grid via a small switching and transformer substation just east of SAM Site C27-2. The substation appears to have equipment installed to handle one in-and-out circuit.

Terminus of the incoming powerline is a secured transformer substation approximately 160 by 170 feet in area, located immediately east of the barracks area and on the north side of the complex access road (Figures ___ and ___). The substation has a small control building which probably contains some provision for housing low-voltage switching equipment. The substation has 3 probable switching positions and two 3-phase stepdown transformers, but an estimate of their mva capacities is not possible on the basis of available photography.

DOG HOUSE

The suspect AMM phased-array radar (DOG HOUSE) installation near Naro-Fominsk is 35.7 nm west-southwest of Moscow, at 55-29-50N 36-41-10E. It will receive power from a large transformer and switching substation, 11,700 feet west of Operational Area A, which apparently will be a major substation on the 220-kv grid serving Moscow. Electrical equipment was still in the process of being installed in [redacted] (Figure ___). At that time, four 220-kv powerlines from the southwest had reached the 220-kv switching yard of the substation. Of these, the northernmost powerline, Figure ___, item 2) is supported by standard USSR design 2-circuit 3-phase steel or

25X1D

aluminum lattice powerline supports, but switching and circuit-breaker equipment had been provided in the switching yard to receive only one of these circuits. The supports (items b-d) for each of the remaining three 220-kv powerlines appear to be designed to carry only 2 conductors apiece; consequently, two 3-phase circuits have to be carried on 3 lines of powerline supports. Both circuits are tied into switching and circuit-breaker equipment in the switching yard.

25X1D [redacted] photography there was no evidence of the installation of 220-kv stepdown transformers; however, the equipment already installed indicated that at least 3 banks of 3 single-phase, stepdown 220/35/10- or 6-kv transformers probably were planned. The south end of the control building could contain as many as 90 low-voltage switching positions.

25X1D

A small separately secured switching yard was located in the southeast corner of the substation, and [redacted] photography revealed switching and circuit-breaker equipment for 4 incoming 35-kv circuits and for 2 internal circuits. No stepdown transformers were visible, but it is possible that the control building may house low voltage switching equipment as well as 35/10- or 6-kv transformers. The south end of the control building could contain as many as 90 low-voltage switching positions.

TRIADS AT FOUR MOSCOW SA-1 SAM SITES

The possible AMM electronic facilities (triads) at 4 SA-1 SAM sites in the Moscow area (Figure ___) are estimated to have an electric power supply of 10 or 6 kv. Power at these voltages can be supported on ordinary wooden, metal, or reinforced concrete poles such as are also used for telephone and telegraph circuits. They usually can be identified only on high resolution photography of adequate scale, taken under

optimum conditions. Soviet equipment for 10 and 6 kv powerlines is almost identical, therefore exact voltage cannot be determined from photography alone. At none of the sites can any higher voltage supply be identified on available photography, and it is possible that the higher voltages of the Moscow grid (110-, 220-, and 500-kv) are kept isolated from the triads to avoid electrical interference with any electronic equipment which may be at the sites. Each of the SA-1 sites is in the vicinity of a substation on a 110-kv powerline of the Moscow power grid of the Soviet Unified Power System.

TRIAD AT SAM SITE E05-1 25X1A

SAM Site E05-1 [redacted] is at 56-14-35N 38-35-05E. At the northeast corner of the site, within the double fence that surrounds the area containing the triad and a triad under construction, there are several buildings north of the largest building in the completed triad. One of these small buildings is separately secured and is a suspect substation that may house control and low-voltage switching equipment. The scale of available photography is too small to permit identification of open-air transformers. No traces for high-tension powerlines serving this installation can be seen, indicating that only low-voltage power serves the site.

Incoming power is probably supplied by a 110-kv powerline of the Moscow power grid and stepped down at a nearby substation located at approximately 56-13N 38-30E. A trace approximately parallels the highway between Zagorsk and Orekhov-Zuyevo, and spacing of the supports is typical of 110-kv powerlines.

MOSCOW SAM SITE E15-1

In the northeast corner of the triad area there is a small secured substation with a building that probably houses control and low-voltage switching equipment, and there is switching equipment located northeast of the building. The electric power at the SAM site is most likely similar to that at SAM Site E05-1. A possible 110-kv powerline trace of the Moscow power grid roughly parallels the Voskresens-Malino highway, which is to the north of the SAM site. A small suspect substation on that line is at approximately 55-11N 38-19E, about 3 nm north of the SAM site (Figure ___), and is probably tied into the substation in the triad area.

MOSCOW SAM SITE E24-1

A secured substation is located adjacent to the southwestern entrance to the SAM site, near the triad area. No traces for high-tension powerlines serving the SAM site can be seen, indicating that only low-voltage power serves the site. Power probably is supplied at 10 or 6 kv from a suspect substation on a probable 110-kv powerline of the Moscow power grid. That suspect substation is about 2 1/2 nm east-northeast of the SAM site (Figures _____).

MOSCOW SAM SITE E33-1

A suspect substation may be located near the west entrance to the secured triad area. Power is probably supplied to this facility at 10 or 6 kv from a substation on a 110-kv powerline. The substation is at 56-19N 36-45E, at the southeastern limits of Klin and approximately 2 1/2 nm southwest of the triad area.

SARY-SHAGAN TRIADS

25X1D The Balkhash power grid (Figure ___), which serves Sary-Shagan Antimissile Test Center (SSATC) west of Lake Balkhash, was first studied from TALENT photography of [redacted] On that photography, a 110-kv powerline was identified that tied the large transformer substation near the Main Housing Complex to the Balkhash grid. Also at that time, a single circuit 3-phase 35-kv powerline connected Balkhash to Gulshad, which is ___ nm northeast of Sary-Shagan. Other powerlines served mining and ore-processing installations north of Balkhash, at Kouradskiy and vicinity.

25X1D [redacted] the thermal powerplant in Balkhash was expanded by the addition of a new section and a second stack. This powerplant is the principal source of electricity used at SSATC. Small local generating plants possibly exist at some installations within the Test Center; however, they apparently do not provide power for the installations studied for this report.

TRIAD, INSTRUMENTATION SITE 2

Instrumentation Site 2, at 45-47-40N 73-35-00E, is the southernmost installation in the support base at SSATC. TALENT photography of [redacted] revealed a small 25X1D secured transformer substation approximately 2 nm north of Site 2, on the west side of the site access road. At that time it received power from the substation at the main housing complex (Figure ___).

25X1D Photography of [redacted] showed a second powerline paralleling the earlier one. Each is probably a single circuit, 3-phase, 35-kv powerline and is tied into one of two 35-kv stepdown transformers within the secured area. The small scale of available photography precludes estimating the mva capacity of the transformers.

25X1D

[redacted] cable scars were apparent between the substation and both Instrumentation Site 2 and the area where HEN ROOST antennas were under construction. It is estimated that the voltage carried by these buried cables is 10 or 6 kv because higher voltage cables are seldom buried.

Recent photography reveals that the buried cable to the Operations Area, which is closely associated with the triad in Instrumentation Site 2, is possibly tied into a small possible control and low-voltage switching building immediately east of the T-shaped building (Figure ___). Possible cable scars radiate from the vicinity of the building to other facilities of Site 2.

TRIAD, LAUNCH COMPLEX B

Two 110-kv powerlines are generally parallel to the road between the Main Support Base and Launch Complex B. The 2 single-circuit 3-phase powerlines are tied into a substation with 2 transformers. It is located at 45-58N 73-32E, in the middle of Launch Complex B support area between the housing area and technical facilities (Figure ___). A low-voltage powerline that follows the road between the support area and the launch area has been in service for some time. It is estimated to be 10- or 6-kv powerline, both because the poles are set for short spans and because their shadows give no evidence of crossarms such as are indicated for support of a 35-kv or higher voltage powerline.

During the period in which the triad was under construction in the launch area, a single-circuit, 3-phase, 110-kv powerline was also under construction to the triad area from a suspect substation in the southeast corner of the triad area. The completion of this powerline or of the substation cannot be confirmed from photography available through [redacted], nor can an estimate of available capacity be given in mva. 25X1D

TRIAD, INSTRUMENTATION SITE 10

A small secured probable transformer substation is located at 46-56N 73-31E, in the center of the support area of Instrumentation Site 10 (Figure ___). The substation is the probable terminus of a 3-phase 110-kv powerline, probably two circuits, which is tied into a substation in the headquarters and administration area of Launch Complex A.

TRIAD, SITE 13 25X1D

25X1D Two adjacent substations have been identified at Site 13, northwest of the dual HEN HOUSES and triad. The small secured transformer substation at 47-37N 74-31E is [redacted] and has probably served Site 13 since construction began in that area, although its existence could not be positively confirmed until [redacted] It appears to be of standard Soviet design and is the terminus of a tap-off single-circuit 3-phase 35-kv powerline. The powerline is tied into the Balkhash-Gulshad 35-kv powerline by drop wires (Figure 27, inset B).

A second, much larger, transformer substation was in the final stages of construction in [redacted] approximately 300 feet east of the smaller substation. Two

25X1D

25X1D

buildings had been completed and support framing for 6 switching positions and probably 2 buses had been installed by [redacted] Provision was being made at that time for the installation of 2 probably 110/10- or 6-kv transformers, and one of these had been installed by [redacted] (Figure ___). Some 35-kv switching equipment was also being installed. 25X1D

A 2-circuit 3-phase 110-kv powerline between the larger substation and the 25X1D
25X1D powerline between Balkhash and the Main Support Base at SSATC was complete in [redacted] and construction had been started on another 110-kv powerline generally parallel to it (Figures ___ and ___). Some support towers had been installed and concrete footings for others had been poured. One support was lying on the ground near the substation.

25X1D [redacted] it appeared most likely that one of the two circuits between Balkhash and Sary-Shagan had been, or would be, cut to detour power through the switching facilities at the larger substation at Site 13 (Figure ___). The smaller substation probably would be either abandoned or disconnected from the Balkhash-Gulshad powerline and would receive stepped down power from the 110-kv transformers in the larger substation. Low-voltage power for the HEN HOUSES and triad is, or will probably be, transmitted by buried cable.

DUAL HEN HOUSE-TYPE INSTALLATIONS

25X1D

[redacted] HEN HOUSE-type installations, all under construction in [redacted] will receive power from 110-kv powerlines that serve onsite transformer substations. At each site, apparently there will be 2 incoming single-circuit powerlines and 2

stepdown transformers. Provision is being made to keep the incoming circuits separated, and at Angarsk and Olenegorsk sites the power is actually received from 2 directions, thus helping to insure that a continuous power supply will be available even if an outage should affect one incoming circuit.

OLENEGORSK DUAL HEN HOUSE-TYPE INSTALLATION 25X1D

The dual HEN HOUSE-type installation under construction in [redacted] at 68-07N 33-55E, 13 nm east of Olenegorsk, received power from the Murmansk power grid. A major switching and transformer substation of the grid is located near the Olenegorsk railroad yards of the north-south electrified railroad which serves Murmansk and the Kola peninsula. Power is received at the HEN HOUSE-type installation through an onsite secured transformer and switching substation which covers an area of approximately 460 by 240 feet, located at the southeastern end of the support area.

Incoming powerlines from the grid are 2 single-circuit 3-phase 110-kv powerlines whose conductors are supported mainly by timber pi-portal supports with timber A-frame supports at angular changes of direction. Whether both circuits were in service in [redacted], could not be determined from available photography. 25X1D

Power from these 2 circuits could be switched out of the substation through an outgoing single-circuit powerline that runs in an easterly direction to Alluaiv. This powerline parallels a 110-kv single-circuit powerline that ties a substation of the [redacted] also to Alluaiv. A probably single-circuit powerline can be traced further east between Alluaiv and Lovozero. 25X9

The unusual crisscrossing of powerlines of the same voltage (110-kv) possibly indicates the following sequence of construction. The first powerline appears to

25X9

have been that tying the substation at [redacted] to Alluaiv. The second, more direct, powerline probably was that tying the Olenegorsk Airfield also to Alluaiv. During the early construction phases of the dual HEN HOUSE-type facility this second powerline was cut and sometime after [redacted] both portions were tied into the onsite substation by short taplines supported over the first powerline. Later, additional power was tied into the onsite substation by the addition of a 25X1D third powerline, directly from the major Olenegorsk switching and transformer substation. This new powerline required 2 additional crossings of the earlier powerlines. 25X1D Electrical equipment had not been fully installed at the onsite substation in [redacted] Electrical equipment for 6 switching positions was probably in place, and one of probably 2 transformers planned had been installed. The size of this transformer indicates that it probably has a capacity ranging between 10 and 20 mva.

ANGARSK DUAL HEN HOUSE-TYPE INSTALLATION 25X1D

25X1D The Angarsk dual HEN HOUSE-type installation, still under construction in [redacted] at 52-53N 103-15E, is served by the Siberian portion of the Soviet Unified Power System. A secured transformer substation in the support area of the installation will eventually receive power over 2-circuit 3-phase 110-kv powerlines. One of these may be, and the second will be, tied into the local 110-kv power grid that follows the Angara River valley between Angarsk and Cheremkhovo. 25X1D

Excellent photography of [redacted] has permitted the identification and plotting of all powerlines of 500-, 220-, and 110-kv, and some of 35-kv, in the vicinity of the dual HEN HOUSE-type installation.

25X1D

It is estimated that when the construction activities underway in [redacted] have been completed, the installation will be able to draw power both from the southeast (the Angarsk-Irkutsk area) and from the northwest (the Bratsk area), through a newly identified major switching and transformer substation south of Cheremkhovo at 53-05N 103-04E (Figure ___). The incoming powerline from the direction of Angarsk apparently was completed before [redacted] and tied into the onsite substation. 25X1D The incompleted powerline from the direction of the Cheremkhovo substation is to be supported on timber pi-portal supports which were, for the most part, in place in [redacted] When the dual HEN HOUSE-type installation is activated, the dual 25X1D directional power feed will provide security against complete power failure in the event of an outage of one of the two circuits.

25X1D On [redacted] photography two transformers can be identified at the onsite substation and space for a possible third transformer is evident. The northernmost is estimated to have a capacity of 20 to 31.5 mva and the other may have a capacity of 45 to 60 mva. Calculations (or estimates) are based on lengths of 20 and 25 feet, plus or minus 5 feet, respectively. Exact mensuration is obviated by obliquity and dark shadows.

It must be noted that any power transmitted through the single-circuit 220-kv powerline and the two parallel 500-kv single-circuit powerlines is available only indirectly. Power from the 220-kv powerline comes through the Cheremkhovo substation, and power from the 500-kv powerlines comes through (via) Substation B at the Angarsk Atomic Energy Complex. _/

DUAL HEN HOUSE-TYPE INSTALLATION, SITE 13, SSATC

The dual HEN HOUSE-type installation under construction at Site 13, SSATC, will receive power through the same facilities which will serve the Triad at the same site (Figures _____).

OTHER INSTALLATIONS AT SSATC

SINGLE HEN HOUSE, SSATC

The single HEN HOUSE installation at SSATC is served by a secured onsite transformer substation that covers an area of _____ by _____ feet. It is located on the east side of the coastal road between the Main Housing Base and Instrumentation Site 2. The substation may be the terminus of a single circuit 3-phase, probably 35-kv powerline from the 35-kv switching yard of the main substation near the Main Housing Support Area. Available photography permits the identification only of one possible transformer, and further electrical details cannot be ascertained.

TWO HEN ROOSTS, SSATC

The 2 HEN ROOST installations south of the single HEN HOUSE installation apparently receive power through a secured probable substation at the north end of the support area for the southern HEN ROOST. Whether one or two 35-kv circuits have been tied into this substation cannot be ascertained from the photography. One probable transformer can be identified.